What is claimed is:

1. A method for analyzing an extended object comprising:

(a) moving with respect to at least one station a plurality of similar extended objects that are each similarly labeled with at least two unit-specific markers to generate a plurality of object-dependent impulses as the labeled extended objects pass the station;

(b) measuring the generated plurality of object-dependent impulses as a function of one or more system parameters; and

(c) calculating an autocorrelation function of said object-dependent impulses, to analyze the extended object.

2. The method of Claim 1 wherein the labeled extended objects are moved at similar velocities and the object-dependent impulses are measured as a function of time.

3. The method of Claim 1, wherein the plurality of extended objects is a plurality of polymers.

4. The method of Claim 3, wherein each polymer in the plurality of polymers is identical to every other polymer in the plurality of polymers.

5. The method of Claim 4, wherein each polymer in the plurality of polymers is labeled with identical unit-specific markers at identical positions within the polymer.

6. The method of Claim 3, 4 or 5, wherein each polymer in the plurality of polymers is a nucleic acid.

7. The method of Claim 6, wherein the nucleic acid is DNA.

8. The method of Claim 2, wherein the autocorrelation function is defined by the formula:

$$G(\tau) = 1/T \int_0^T I(t)\, I(t + \tau)\, dt$$

where $G(\tau)$ is the autocorrelation function of the time dependence of measured object-dependent impulses, T is the total time of measurement of I(t), and I(t) is the object-dependent impulse measurement at each time point t.

9. The method of Claim 2, wherein the autocorrelation function is defined by the formula:

$$G_j=(1/N)\sum_{i=0}^{N} I_i I_{i+j}$$

where G_j is the autocorrelation function of the time dependence of measured object-dependent impulses at time $j\Delta t$, $N\Delta t$ is the total time of measurement of I_i, and I_i is the object-dependent impulse measurement at each time point i, and Δt is a time interval.

10. The method of Claim 1, wherein the at least one station is a plurality of stations.

11. The method of Claim 10, wherein the plurality of extended objects are moved through a lattice of beads and the plurality of stations are positioned on a subset of the plurality of beads.

12. The method of Claim 8, 9 or 11, wherein the plurality of extended objects is a plurality of polymers.

13. The method of Claim 12, wherein each polymer in the plurality of polymers is a nucleic acid.

14. The method of Claim 13, wherein the nucleic acid is DNA.

15. The method of Claim 10, wherein the plurality of extended objects is moved through a channel, said channel having a first end, a second end, and at least one wall, the plurality of stations being positioned along the at least one wall.

16. The method of Claim 10, wherein the plurality of extended objects is moved through a channel, said channel having a first end, a second end, and at least one wall, the plurality of stations being positioned at said first end or said second end.

17. The method of Claim 15 or 16, wherein the plurality of extended objects is a plurality of polymers.

18. The method of Claim 17, wherein each polymer in the plurality of polymers is a nucleic acid.

19. The method of Claim 18, wherein the nucleic acid is DNA.

20. The method of Claim 10, wherein the plurality of extended objects is moved simultaneously through a plurality of channels, each channel in said plurality of channels having a first end, a second end, and at least one wall, each channel having at least one station positioned along the at least one wall.

21. The method of Claim 10, wherein the plurality of extended objects is moved through a plurality of channels, each channel in said plurality of channels having a first end, a second end, and at least one wall, each channel having at least one station positioned at said first end or said second end.

22. The method of Claim 20 or 21, wherein the plurality of extended objects is a plurality of polymers.

23. The method of Claim 22, wherein each polymer in the plurality of polymers is a nucleic acid.

24. The method of Claim 23, wherein the nucleic acid is DNA.

25. The method of Claim 1, wherein the plurality of extended objects is moved through the action of at least one molecular motor.

26. The method of Claim 25, wherein the at least one molecular motor is a plurality of molecular motors in solution.

27. The method of Claim 25 or 26, wherein the plurality of extended objects is a plurality of polymers.

28. The method of Claim 27, wherein each polymer in the plurality of polymers is a nucleic acid.

29. The method of Claim 28, wherein the nucleic acid is DNA.

30. The method of Claim 1, wherein each extended object in the plurality of extended objects is labeled with at least two unit-specific markers that generate at least two different object-dependent impulses as the labeled extended objects pass the station.

31. The method of Claim 30, wherein the plurality of extended objects is a plurality of polymers.

32. The method of Claim 31, wherein each polymer in the plurality of polymers is a nucleic acid.

33. The method of Claim 32, wherein the nucleic acid is DNA.

34. The method of Claim 1 wherein the object-dependent impulse is fluorescence resonance energy transfer.

35. The method of Claim 34, wherein the at least one fixed station comprises at least one donor fluorophore and the plurality of extended objects are each labeled with at least two acceptor fluorophores.

36. The method of Claim 34, wherein the at least one fixed station comprises at least one acceptor fluorophore and the plurality of extended objects is each labeled with at least two donor fluorophores.

37. The method of Claim 34, 35 or 36, wherein the plurality of extended objects is a plurality of polymers.

38. The method of Claim 37, wherein each polymer in the plurality of polymers is a nucleic acid.

39. The method of Claim 38, wherein the nucleic acid is DNA.

40. The method of Claim 1, wherein the repetitive information in the generated plurality of object-dependent impulses provides information about the length of the extended objects.

41. The method of Claim 1, wherein analysis of the extended object provides information about the distance between labels on the extended object.

42. The method of Claim 2, wherein analysis of the extended object provides information about the velocity of the extended object.

43. The method of Claim 1, wherein analysis of the extended object provides information about the linear arrangement of units within the extended object.

44. The method of Claim 40, 41, 42 or 43, wherein the plurality of extended objects is a plurality of polymers.

45. The method of Claim 44, wherein each polymer in the plurality of polymers is a nucleic acid.

46. The method of Claim 45, wherein the nucleic acid is DNA.

47. A method for analyzing an extended object comprising calculating an autocorrelation function of object-dependent impulses.

48. The method of Claim 47, wherein the extended object is a polymer.

49. The method of Claim 48 wherein the polymer is a nucleic acid.

50. The method of Claim 49, wherein the nucleic acid is DNA.

51. The method of Claim 47, wherein the autocorrelation function is defined by the formula:

$$G(\tau) = 1/T \int_0^T I(t)\, I(t + \tau)\, dt$$

where $G(\tau)$ is the autocorrelation function of the time dependence of measured object-dependent impulses, T is the total time of measurement of I(t), and I(t) is the object-dependent impulse measurement at each time point t.

52. The method of Claim 47, wherein the autocorrelation function is defined by the formula:

$$G_j=(1/N)\sum_{i=0}^{N} I_i I_{i+j}$$

where G_j is the autocorrelation function of the time dependence of measured object-dependent impulses at time $j\Delta t$, $N\Delta t$ is the total time of measurement of I_i, and I_i is the object-dependent impulse measurement at each time point i, and Δt is a time interval.

53. The method of Claim 47, wherein the extended object is labeled with at least two unit-specific markers that generate at least two different object-dependent impulses.

54. The method of Claim 53, wherein the extended object is a polymer.

55. The method of Claim 51, 52 or 54, wherein the polymer is a nucleic acid.

56. The method of Claim 55, wherein the nucleic acid is DNA.

57. The method of Claim 47 wherein the object-dependent impulse is fluorescence resonance energy transfer.

58. The method of Claim 57, wherein the extended object is a polymer.

59. The method of Claim 68, wherein the polymer is a nucleic acid.

60. The method of Claim 59, wherein the nucleic acid is DNA.

61. The method of Claim 47, wherein the analysis of the extended object provides information about the length of the extended object.

62. The method of Claim 47, wherein analysis of the extended object provides information about the distance between labels on the extended object.

63. The method of Claim 47, wherein analysis of the extended object provides information about the velocity of the extended object.

64. The method of Claim 47, wherein analysis of the extended object provides information about the linear arrangement of units within the extended object.

65. The method of Claim 61, 62, 63 or 64, wherein the extended object is a polymer.

66. The method of ~~Claim 65~~, wherein the polymer is a nucleic acid.

67. The method of Claim 66, wherein the nucleic acid is DNA.

68. An article of manufacture comprising a lattice of spherical beads having a plurality of fixed stations with at least one fluorophore positioned at each fixed station.

69. The article of Claim 68, wherein the lattice includes spaces between the spherical beads of at least 10 nm.

70. The article of Claim 68, wherein the lattice includes spaces between the spherical beads of at least 50 nm.

Sub AA1

71. A system for analyzing an extended object labeled with at least two unit-specific markers comprising:

a central processing unit;

an input device for inputting a plurality of object-dependent impulses of an extended object;

an output device;

a memory;

at least one bus connecting the central processing unit, the memory, the input device, and the output device;

the memory storing a calculating module configured to calculate an autocorrelation function for said plurality of object-dependent impulses of said extended object input using said input device.

72. The system of Claim 71, wherein the plurality of object-dependent impulses is input as a function of time using said input device.

73. The system of Claim 72, wherein the autocorrelation function is defined by the formula:

$$G(\tau) = 1/T \int_0^T I(t)\, I(t + \tau)\, dt$$

where $G(\tau)$ is the autocorrelation function of the time dependence of measured object-dependent impulses, T is the total time of measurement of I(t), and I(t) is the object-dependent impulse measurement at each time point t.

74. The system of Claim 72, wherein the autocorrelation function is defined by the formula:

$$G_j=(1/N)\sum_{i=0}^{N} I_i I_{i+j}$$

where G_j is the autocorrelation function of the time dependence of measured object-dependent impulses at time $j\Delta t$, $N\Delta t$ is the total time of measurement of I_i, and I_i is the object-dependent impulse measurement at each time point i, and Δt is a time interval.

75. The system of Claim 71, the memory further storing a storage module configured to store object-dependent impulses of an extended-object.

76. The system of Claim 75, the memory further storing a comparison module configured to compare object-dependent impulses of at least two extended-objects.

77. The system of any one of Claims 71-76, wherein the extended object is a polymer.

78. The system of Claim 77, wherein the polymer is a nucleic acid.

79. The system of Claim 78, wherein the nucleic acid is DNA.

80. The system of Claim 71, wherein the plurality of object-dependent impulses results from fluorescence resonance energy transfer.

81. The system of Claim 71, further comprising an apparatus for stretching said extended object.

82. The system of Claim 81, wherein said extended object is a polymer.

83. The system of Claim 82, wherein said polymer is a nucleic acid.

84. The system of Claim 83, wherein said nucleic acid is DNA.

85. The system of Claim 71, further comprising a laser, optical elements, and a detector operably linked to produce and detect object-dependent impulses of said extended object.

86. The system of Claim 85, wherein said detector is a photodetector.

87. The system of Claim 85, wherein said extended object is a polymer.

88. The system of Claim 87, wherein said polymer is a nucleic acid.

89. The system of Claim 88, wherein said nucleic acid is DNA.

Sub A42

90. A computer program product for use in conjunction with a computer, the computer program product comprising a computer readable storage medium and a computer program mechanism embedded therein, the computer program mechanism comprising a

calculating module configured to calculate an autocorrelation function of a plurality of object-dependent impulses.

91. The computer program product of Claim 90, wherein the plurality of object-dependent impulses is input as a function of time using said input device.

92. The computer program product of Claim 91, wherein the autocorrelation function is defined by the formula:

$$G(\tau) = 1/T \int_0^T I(t)\, I(t+\tau)\, dt$$

where $G(\tau)$ is the autocorrelation function of the time dependence of measured object-dependent impulses, T is the total time of measurement of I(t), and I(t) is the object-dependent impulse measurement at each time point t.

93. The computer program product of Claim 91, wherein the autocorrelation function is defined by the formula:

$$G_j=(1/N)\sum_{i=0}^{N} I_i I_{i+j}$$

where G_j is the autocorrelation function of the time dependence of measured object-dependent impulses at time $j\Delta t$, $N\Delta t$ is the total time of measurement of I_i, and I_i is the object-dependent impulse measurement at each time point i, and Δt is a time interval.

94. The computer program product of Claim 90, the memory further storing a storage module configured to store object-dependent impulses of an extended-object.

95. The computer program product of Claim 90, the memory further storing a comparison module configured to compare object-dependent impulses of at least two extended-objects.

96. The computer program product of Claim 90, wherein the extended object is a polymer.

97. The computer program product of Claim 90, wherein the polymer is a nucleic acid.

98. The computer program product of Claim 90, wherein the nucleic acid is DNA.

99. The computer program product of Claim 90, wherein the plurality of object-dependent impulses results from fluorescence resonance energy transfer.

100. The computer program product of Claim 90, wherein analysis of the extended object provides information about the length of the extended object.

101. The computer program product of Claim 90, wherein analysis of the extended object provides information about the distance between labels on an extended object.

102. The computer program product of Claim 90, wherein analysis of the extended object provides information about the velocity of the extended object.

103. The computer program product of Claim 90, wherein analysis of the extended object provides information about the linear arrangement of units within the extended object.

104. The system of Claim 85 further comprising an apparatus for stretching said extended object.